

lip 54 and/or fin 66 serve to avoid snagging of tube tip 18 on the rear surface 84 of epiglottis 82, the vocal cords (as represented by glottis 88), and/or the cartilaginous rings 90 within trachea 86 (only three shown). Thus, the curvature of outer surface 60 of lip 54 and/or fin 66 provides a bearing surface than deflects the tube tip 18 in a sliding manner off from and/or along those anatomical processes such that tube tip 18 may be fully inserted into trachea 86 without snagging along the way. More specifically, the curvature of lip 54 helps orient the free edge 58 such that it is aligned with the midline of the posterior commissure of the glottis 88 (where the space between the vocal cords is greatest), and is aimed away from the anterior commissure of the glottis 88 (where the space between the vocal cords is narrowest). The fin 66 is useful to help wedge apart a narrow glottic opening.

Tube 10 is pushed against guide wall 74 such that tube tip 18 passes into and beyond laryngeal opening 70. The tube continues to be pushed therealong until seated within trachea 86 as desired. Thereafter, guide wall 74 may be removed from throat 72 while leaving tube 10 in place.

The partial bevel 50 and lip 54 of tube 10 also facilitate intubation with an orotracheal introducer (such as a tubular fiberbundle 100 of a laryngoscope) as will now be described with reference to FIGS. 5A, 5B, and 5C. To this end, introducer 100 is inserted into tube 10 from proximal end 14 thereof such that a distal portion 102 of introducer 100 projects out beyond distal tube end 18. Distal end 102 of introducer 100 is inserted into the trachea 86 and tube 10 is then railroaded over introducer 100. The curvature of lip 54 causes the free edge 58 thereof to be turned away from epiglottis 82 as tube tip 18 passes thereover to avoid snagging on epiglottis 82 and to facilitate sliding of bearing surface 60 and tube surface 38 down the rear surface 84 of epiglottis 82. As tube 10 is railroaded over introducer 100, bevel 50 will pass against posterior edge 78 of laryngeal opening 70 at which time rear-facing bevel helps tube tip 18 pass thereover and into laryngeal opening 70 without snagging on edge 76. The curved lip 54, meanwhile, provides a bearing surface 60 to help slide between the vocal cords at glottis 88 without snagging, as exemplified schematically in FIG. 5B (in which event, fin 66 is not necessary). Tube 10 is seated down in the trachea 86 by further railroad along introducer 100 such that bearing surface 60 of curved lip 54 will slide along cartilaginous rings 90 as tube tip 18 passes into the trachea (FIG. 5C). Thereafter, introducer may be removed by pulling it out from the proximal end 14 of tube 12.

In some applications, it may be helpful to provide additional ventilating capacity through distal end 18, in addition to opening 56. To this end, and with reference to FIG. 6, distal end 18 may be modified by inclusion of a hole or Murphy eye 120 formed completely through a lateral wall aspect 42 so as to be situated just above and lateral to posterior bevel 50, and below cuff 24. A pair of Murphy eyes may be positioned in confronting relationship such that the lateral disposition thereof provides alternate pathways for gas flow to the right and left mainstream bronchi (not shown) in case the opening 56 becomes occluded.

With reference to FIG. 7, a further alternative embodiment is shown of the distal end 18 of tube 10 in which lip 54' thereof is modified from lip 54 of the prior embodiments in that lip 54' includes a portion 200 that is offset outwardly of midline axis 52 and protrudes beyond the cylinder of outer surface 38 of anterior wall aspect 36. Lip 54' then curves back toward midline axis 52 and posterior wall aspect 30. Due to offset portion 200, however, the extent of curvature of lip 54' is such that tip 64 thereof is substantially

aligned with inner surface 40 of wall aspect 36 and so does not protrude into the pathway of lumen 22. Lip 54' projects at an angle ϕ measured between a line tangent to the midpoint of inferior or outer surface 60 of lip 54' and midline axis 52 of between about 30° and 40°.

In use, a 7.0 mm or 7.5 mm ID endotracheal tube 10 (with or without Murphy eyes 120 and/or fin 66 as desired) is manually lubricated with a film of sterile, water-soluble, biocompatible lubricant such as Surgilube available from Altana, Inc., in Melville, N.Y. The lubricated tube 10 is inserted into the trachea 86 by use of a blind intubation guide device having a guide wall 74 as described in my aforesaid '805 patent and/or concurrently-filed patent application, after which the guide device is removed. Alternatively, a similarly-lubricated introducer 100 is inserted through tube 10 and inserted into the trachea 86 as desired. Tube 10 is then railroaded downward thereover and into the trachea 86. Introducer 100 may then be withdrawn through tube proximal end 14. In either case, the incomplete rear-facing bevel 50 and the depending lip 54 allow the tube 10 to be readily inserted into the throat 72 and trachea 86 without snagging on anatomical features of and within the laryngeal opening and trachea.

By virtue of the foregoing, there is thus provided an endotracheal tube that facilitates intubation from above the laryngeal opening, such as with a blind intubation guide and/or an orotracheal introducer, without snagging on the anatomical features of the laryngeal opening and trachea.

While the present invention has been illustrated by the description of embodiments thereof, and while the embodiments have been described in considerable detail, it is not intended to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. For example, lip 54 or 54' may be provided without a bevel 50 to tube end 18. Alternatively, lip 54 or 54' may not be curved and/or may not include fin 66. Further, a barium sulfate strip (not shown) may be included in wall 20 for x-ray visualization. The invention in its broader aspects is, therefore, not limited to the specific details, representative apparatus and method, and illustrative examples shown and described. Accordingly, departures may be made from such details without departing from the spirit or scope of the general inventive concept.

Having described the invention, what is claimed is:

1. An endotracheal tube comprising a tubular member extending between a proximal end and a distal end, the tubular member having first wall aspect and a second, oppositely disposed wall aspect along its length to define an airway lumen therebetween for flow of gas between the proximal end and an opening at the distal end, the tubular member having a generally pre-defined curvature, the distal end having an incomplete bevel extending from the first wall aspect toward but not completely through the second wall aspect of the tubular member to define a plane extending through the first wall aspect but not completely through the second wall aspect, the distal end further having a lip projecting beyond the plane defined by the incomplete bevel from the second wall aspect of the tubular member and curving inwardly toward the first wall aspect.

2. The endotracheal tube of claim 1 wherein the distal end has a longitudinal midline axis spaced a distance D from the second wall aspect, the lip extending to a free edge a distance less than D whereby not to occlude the opening at the distal end.

3. The endotracheal tube of claim 1 wherein the lip tapers to a free edge.